

TITLE OF THE INVENTION

DATA PROCESSING APPARATUS CONNECTABLE TO A LAN

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BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

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The present invention relates to a data processing apparatus such as a facsimile apparatus having the capability of data communication. More particularly, the present invention relates to a data processing apparatus connectable to another apparatus via a LAN (local area network).

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DESCRIPTION OF THE RELATED ART

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Some conventional data processing apparatuses such as a facsimile apparatus have the capability of sending an error message to an another apparatus when an error such as a printer error, insufficiency of free memory area of image data memory for storing image data, etc., occurs in the facsimile apparatus. However, a facsimile apparatus of this type suffers from the problem that the receiving operation stops until the apparatus recovers from the error.

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Furthermore, in a conventional facsimile apparatus,

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when the apparatus receives a large amount of data during image data communication, since the decoding rate is slow compared to the line transmission rate, the receiving memory often becomes busy, and action (such as sending an RNR signal) is taken according to a protocol procedure. As a result, the total communication time becomes longer, and in some cases, the communication is terminated before completion. On the other hand, when the facsimile apparatus transmits a large amount of image data, since the reading rate of its scanner is higher than the transmission rate, memory for storing transmission data often becomes busy, and thus the machine must take action such as stopping the scanner operation.

#### SUMMARY OF THE INVENTION

In view of the above, it is an object of the present invention to provide a data processing apparatus having the capability of accepting data transmitted by another apparatus even when an error occurs in the data processing apparatus.

It is another object of the present invention to provide a data processing apparatus that can continue the transmission/reception of image data and the data storing operation without prolonging the communication time even when memory for storing image data is busy.

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It is still another object of the present invention to provide a data processing apparatus having the capability of detecting an error in a LAN when connected to the LAN.

5 It is another object of the present invention to provide a data processing apparatus having the capability of transferring image data to another data processing apparatus connected to a LAN depending on the status of the data processing apparatus connected to the LAN.

10 It is further object of the present invention to provide a data processing apparatus having the capability of receiving image data from another apparatus connected to a LAN.

15 It is another object of the present invention to provide a data processing apparatus that can be controlled by another apparatus connected to a LAN.

#### BRIEF DESCRIPTION OF THE DRAWINGS

20 The above and other objects of the invention will become more apparent from the subsequent detailed description with reference to the accompanying drawings in which:

25 Figure 1 is a schematic diagram illustrating a facsimile apparatus according to an embodiment of the present invention wherein the facsimile apparatus is

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connected to a LAN;

Figure 2 is a block diagram illustrating a configuration of a facsimile apparatus according to an embodiment of the present invention wherein only major elements are shown;

Figures 3-5 are flow charts illustrating operation flows of a facsimile apparatus according to an embodiment of the present invention;

Figure 6 is a schematic diagram illustrating a memory area configuration for explanation of a memory managing method in a facsimile apparatus according to an embodiment of the present invention;

Figures 7-15 are flow charts illustrating operation flows of a facsimile apparatus according to an embodiment of the present invention;

Figure 16 is a schematic diagram illustrating stored-page management information managed in a facsimile apparatus according to an embodiment of the present invention;

Figure 17 is a schematic diagram illustrating a table used for managing stored-page management information remaining unused in a facsimile apparatus according to an embodiment of the present invention;

Figures 18 and 19 are flow charts illustrating operation flows of a facsimile apparatus according to an

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embodiment of the present invention;

Figure 20 is a schematic diagram illustrating an example of the configuration of an alarm mechanism in a facsimile apparatus according to an embodiment of the present invention, wherein the alarm mechanism is used to notify a user of LAN conditions;

Figure 21 is a time chart illustrating an example of automatic setting of operation modes in a facsimile apparatus according to an embodiment of the present invention;

Figures 22 and 23 are flow charts illustrating operation flows of a facsimile apparatus according to an embodiment of the present invention; and

Figure 24 is a schematic diagram illustrating the organization of IP addresses used in a TCP/IP protocol.

#### DESCRIPTION OF THE PREFERRED EMBODIMENTS

##### First Embodiment

Figure 1 is a schematic diagram illustrating a system construction to which a facsimile apparatus according to an embodiment of the present invention is applied.

The facsimile apparatus 101 according to the present embodiment has the capability of being connected directly to a LAN 100 (a facsimile apparatus of this type will be referred to a LAN-FAX hereinafter).

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Reference numeral 102 denotes a communication line such as an ISDN (integrated service digital network), a PSTN (public-switched telephone network), etc., that is connected to the LAN-FAX 101.

5           Reference numeral 103 denotes a server machine or a computer for controlling the LAN 100, wherein the server machine 103 acts as a file server for managing files on the LAN 100. Reference numerals 104 denote client machines (information processing terminals) connected to the LAN 100. Reference numeral 105 denotes a printer server that 10           accepts print requests from client machines 104 and outputs print data to printers 106. Each printing apparatus 106 connected to the printer server 105 outputs print image data in a visual form. If an address is 15           designated, a corresponding printing apparatus is selected from the plurality of printing apparatuses 106 connected to the printer server 105, and thus it is possible to perform a printing operation using a desired printing apparatus. Figure 2 is a block diagram illustrating the 20           configuration of the LAN-FAX 101 according to the present embodiment, wherein only major elements are shown. The LAN-FAX 101 performs various processing associated with facsimile communication using a CPU 201 and its peripheral elements. The CPU 201 is connected to ROM 202, RAM 203, 25           image data memory 204, a resolution conversion processing

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performs read/record operations. The modem 208 modulates and demodulates facsimile transmission and reception signals. The NCU 209 performs line control such as automatic calling and answering control in which selection signals (dial pulse or tone dialer) are automatically sent over the communication line 102 and calling tones are automatically detected.

The scanner 211 comprises a CS image sensor, original-document-sheet transfer mechanism, and other elements known to those in the art. The scanner 211 optically reads the information associated with an original document or printed material and converts it into electric image data. The image processor 210 performs various correction processing on the image data read by the scanner 211 and outputs resultant high-quality image data. The operation panel 212 has a keyboard through which an operator inputs various information.

The line buffer 213 stores image data temporarily line by line during transfer of the image data. The LAN interface 214 serves as an interface for the connection to the LAN 100. In this embodiment, the LAN 100 is preferably a network based on a protocol in accordance with the TCP (Transmission Control Protocol)/IP (Internet Protocol). The LAN interface 214 is also based on the protocol in accordance with the TCP/IP.

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The printer 215 is a laser beam printer (LBP) for recording the received image data or file data on recording paper. When file data received from a client machine 104 is printed, the printer formatter 216 analyzes the printer description language and converts the file data to image data according to the analysis result.

If an error occurs in the LAN 100, the external display 217 gives a user warning of the error by displaying a warning message or by causing the display to blink.

A selector 218 analyzes a process command received from a client machine 104 connected to the LAN 100, and sets the operation mode of the LAN-FAX 101 to a communication mode, recording mode, or reading mode according to the analysis result.

Referring to the flow charts shown in Figures 3 and 4, the receiving operation of the LAN-FAX 101 will be described below.

First, sender information, that has been received from a sending station and stored in an NSF (non-standard function) frame, is analyzed and set as a sending user name (step S301). The sender information stored in the NSF frame represents the user name (log-in name) of the destination user and is stored as the destination name in the form of ASCII codes. More specifically, the sender

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information is stored in the RAM 203.

Then, the status of the printer 215 of the LAN-FAX 101 is analyzed. In this embodiment, the possible statuses of the printer 215 include NORMAL status, in which the printer 215 is available, BUSY status, in which the printer 215 is being used in another task, and ERROR status, which means that an error has occurred in the printer 215.

Then, it is determined whether the status of the printer 215 is ERROR status or not (step S302). If the status is not ERROR status, then whether it is BUSY is determined (step S303). If the status is BUSY, then the status of the image data memory 204 in the LAN-FAX 101 is checked (step S304) so as to determine whether an error has occurred in the image data memory 204 judging from the remaining room in the image data memory 204 or from other parameters.

If no errors occur in the image data memory 204, then the process skips the steps associated with the transferring of image data stored in the image data memory 204, and proceeds to step S308, in which image data is received and stored in the image data memory 204, that is, a memory receiving operation is performed. On the other hand, if there is an error in the image data memory 204, then the image data stored in the image data memory 204 is

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(2) A memory-transmission image data file is

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(4) A print image data file is printed as soon as the

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processed in response to user's access, and therefore this type of file has a high transfer priority. A polling transmission image data file is a file that is accessed from the outside via the communication line 102, and therefore its transfer priority is set to a low level. More specifically, the priorities are set in the order of memory-reception image data files > timer-transmission image data files > memory-transmission image data files > print image data file > polling transmission image data file. In other words, files having a greater necessity of remaining in the LAN-FAX 101 remain in the image data memory 204 of the LAN-FAX 101.

In step S305, therefore, image data files are retrieved according to the above transfer priority order. Thus, the file type of an image data file to be transmitted is set (step S306), and the image data file is then transferred to the server machine 103 (step S307).

The transfer of an image data file to the server machine 103 will be described further. First, a transfer image data file is produced on the basis of the address of the server machine 103 associated with the LAN 100. This transfer image data file is produced in accordance with the protocol of the LAN 100 through which the file is to be transferred. In this embodiment, since the protocol of the LAN 100 is defined according to TCP/IP protocol, the

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transfer image data file is constructed according to the TCP/IP protocol. That is, as shown in Figure 24, the transfer image data file is composed of an MAC (Media Access Control) address, an IP header, a TCP header, data, and other fields. In Figure 24, reference numeral 2403 denotes the destination's MAC address (6 bytes), representing the destination to which data is to be sent. Reference numeral 2404 denotes the source's MAC address (6 bytes), representing the source from which the data is sent. MAC addresses are uniquely assigned to individual devices connected to the LAN. These MAC addresses correspond to a data link layer of the OSI layer 7. Reference numeral 2406 denotes an IP header corresponding to the protocol of the network layer in the OSI layer 7. In this IP header, addresses required for accessing a device connected to the network are defined. That is, the IP header includes an IP address 2406a of a source and an IP address 2406b of a destination. Reference numeral 2407 denotes a TCP header corresponding to a transport layer in which prescription is given for ensuring high reliability in the data transfer. Reference numeral 2408 denotes a data field corresponding to an application layer of the OSI layer 7.

In this LAN-FAX 101, when the data destination designated by the MAC address 2403 is an apparatus

connected to the LAN, the data is automatically transferred to that apparatus designated by the address.

As described above, a transfer image data file is organized according to the TCP/IP protocol, and thus includes MAC addresses, an IP header, a TCP header, a data field, and other fields. In this embodiment, when image data to be transferred is stored in memory of the server machine 103, it is required to identify its file type and file number. For this purpose, the above-described data field includes a command data file containing file information associated with the above items as well as an image data file containing image data. A data file transfer operation is controlled by transmitting both these files. Of two types of files, the command data file is analyzed by application software for file type analysis stored in the server machine 103 whereby the server machine 103 manages the file type of a transfer image data file.

When the transfer image data file has been transferred to the server machine 103 in step S307, the available area of the image data memory 204 becomes greater than a required value. Thus, a receiving operation to receive the image data starts, and one page of reception image data is stored in the image data memory 204 (step S308). Then, it is determined whether there is a

next page in the reception image data (step S309). If there is a next page in the reception image data, then the process returns to step S304, in which the memory receiving operation is continued.

5           On the other hand, if there is no further page in the reception image data, then it is determined whether the type of the image data file that was transferred in step S307 is a highest-transfer-priority memory-reception image data file (step S310). If the transferred image data file  
10           is not of that type, the image data file that was transferred to the server machine 103 and saved there temporarily has a higher transfer priority than the image data (received image data file) that has been stored in the image data memory 204 at this time in step S308.  
15           Therefore, the received image data file that has been stored at this time in the image data memory 204 is replaced with the image data file that was saved temporarily in the server machine 103.

          That is, at the first step of the file replacement,  
20           the received image data file that has been stored in the image data memory 204 is transferred to the server machine 103 (step S311). Of the image data files (transfer image data files) saved temporarily in the server machine 103, that image data file having the lowest transfer priority  
25           is transferred back to the image data memory 204 first,

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On the other hand, if the printer 215 is not in the memory receiving mode, that is, if it is in the recording-on-recording-paper receiving mode, then one page of data is received and recorded on recording paper (step S314). Then, whether there is a next page in the receiving image data is determined (step S315). If there is a next page in the receiving image data, then the process returns to step S314 and continues the recording-on-recording-paper receiving operation. If there is no further page in the receiving image data, the operation is complete.

In step S302, if it has been judged that the printer 215 is in the ERROR status, then the data is transferred to the printing apparatus 106 connected to the LAN 100, thereby outputting the data. First, in this case, a print request is sent to the printer server 105 that controls the spooling operation on the LAN 100 associated with print image (step S401). Then, the status information of the printing apparatus 106 sent back in response to the above print request is analyzed so as to determine whether the printing apparatus 106 is available or not (step S402). If the printing apparatus 106 is not available, the process proceeds to the above-described step S304.

If the printing apparatus 106 is available, then an image data receiving operation starts (step S403), and the received image data is transferred in turn to the printer

server 105 (step S404). In the above transferring operation, the image data is configured according to the TCP/IP protocol in which the image data is divided into several portions each including a predetermined amount of image data, and then each portion is transferred in turn. The printer server 105 stores the received image data. When the amount of the received image data has reached one page, the printer server 105 transfers the received image data to a printing apparatus 106, which in turn prints the received image data (step S405). Then, whether the image data receiving operation is complete or not is determined (step S406). If the operation is not complete yet, then the process returns to step S404 to continue the transferring and printing operation. The process during steps S402 through S405 is performed using application software for remote printing that has been installed beforehand in the printer server 105.

After the completion of the receiving operation, the server machine 103 sends a reception-report mail to the user who sent the data so as to report that the received image data file has been printed by means of remote printing on a printing apparatus 106 connected to the LAN 100.

That is, in step S407, the LAN-FAX 101 produces reception-report information based on the sender

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detected in the LAN-FAX 101 during a receiving operation, image data is transferred to the server machine 103.

Alternatively, when the LAN-FAX 101 receives a request to print a file such as a document file produced by a client machine (information processing terminal) 104 connected to the LAN 100, if an error is detected in the LAN-FAX 101, then the file such as a document file to be printed (hereafter refer to as a print file) may be transferred to the printer server 105.

The printing operation by the LAN-FAX 101 will be described referring to the flow chart shown in Figure 5. In this embodiment, the print file is described using a page description language and is printed with fonts developed by the printer formatter 216.

First, the LAN-FAX 101 accepts a print request from a client machine 104 (step S501). Then, the LAN-FAX 101 analyzes which client machine 104 has issued the print request, and obtains and sets address information such as the IP address of the client machine 104 with respect to the LAN 100 (step S502).

The print file is received via the LAN interface 214 and stored in image data memory 204 of the LAN-FAX 101 (step S503). In the above operation, the transmission and reception of the print file are performed according to the TCP/IP protocol.

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The operation status of a printer installed in the LAN-FAX 101 (hereafter referred to as a LAN-FAX printer) 215 is then checked, that is, whether it is available or not is determined (step S504). If it is available, then  
5 the LAN-FAX printer 215 starts a printing operation to print the print file (step S511). Once the printing operation is complete (step S512), the process is complete.

On the other hand, if the LAN-FAX printer 215 is not  
10 available, the operation status of a printing apparatus 106 connected to the LAN 100 is checked to determine whether it is available or not (step S505). The availability of the printing apparatus 106 is determined from the status of the printer server 105 connected to the  
15 LAN 100, wherein the status is reported back in response to a printer status request sent to the printer server 105.

If the printing apparatus 106 is not available, then the process returns to step S504, in which the  
20 availability of the LAN-FAX printer 215 is checked again. On the other hand, if the printing apparatus 106 is available, then the print file is transferred to the printer server 105 (step S506), and printed (remote-printed) by the printing apparatus 106 (step  
25 S507). Then, whether the remote printing is complete or

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not is determined (step S508). If the remote printing is not complete, then the process returns to step S506 to continue the remote printing operation.

5 In the above operation, the print file is configured according to the TCP/IP protocol in which the image data is divided into several portions each including a predetermined amount of image data, and then each portion is transferred in turn. The printer server 105 stores the received print file (image data). When the amount of the  
10 received image data has reached one page, the printer server 105 transfers the received image data to a printing apparatus 106, which in turn prints the received image data. The process during steps S506 through S508 is performed using application software for remote printing  
15 that has been installed beforehand in the printer server 105.

20 Then, the server machine 103 sends a report mail to the user (terminal) who sent the data so as to report that the print file has been printed by means of remote printing with a printing apparatus 106 connected to the LAN 100. That is, in step S509, the LAN-FAX 101 produces a remote print report mail based on the user address information set in step S502, and sends it to the information processing terminal at the above user address  
25 (step S510), and then the process is complete.

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In the second embodiment of the present invention, as described above, when the LAN-FAX 101 receives a print request from a client machine 104, if the printer 215 is incapable of printing it due to an error, then printing is performed using a printing apparatus 106. The server machine 103 sends a report mail to a user who issued the print request to tell that the received data has been remote-printed so that the user can easily know the status from the report mail.

In the first embodiment described earlier, the destination of received image data is designated by destination user name information stored in the NSF frame. However, the present invention is not limited to this. Alternatively, for example, a password may be stored in a password (PWD) frame according to the prescription of the ITU-T standard, and the LAN-FAX 101 may convert the password to user name information. In this case, the LAN-FAX 101 has a password table in which user name information corresponding to passwords is registered, and the LAN-FAX 101 converts a password to user name information by retrieving the password table.

In the first embodiment, when an error is detected in the LAN-FAX 101, an image data file is transferred to the server machine 103. However, the apparatus to which the data file is transferred is not limited to the server

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machine 103. For example, the data file may also be transferred to memory of another LAN-FAX or peripheral apparatus connected to the LAN. Furthermore, not only when the printer is in ERROR status, but also when the printer is in BUSY status, an image data file may be transferred to a printing apparatus 106 or another LAN-FAX 101 so as to print the image data file.

In the first and second embodiments, the protocol associated with the LAN is in accordance with the TCP/IP. However, the present invention is not limited to this. For example, the protocol according to the SPX/IPX or the like may also be employed.

In the first embodiment, when an error is detected in the LAN-FAX 101, an image data file is transferred according to the transfer priority that has been defined beforehand in connection with the file type (attribute). However, the present invention is not limited to this. For example, the transfer priority may also be defined in connection with the size of an image data file or the storage time at which an image data file was stored in the image data memory. Alternatively, a user may define the transfer priority in an arbitrary way without fixing the transfer priority.

In the first and second embodiments, when an error is detected in the printer 215 of the LAN-FAX 101, data is

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transferred to the printer server 105 so as to print the data using a printing apparatus 106. In addition to the above operation mode, which may be referred to as a first mode, there may be a second operation mode in which printing is performed when the printer 215 has recovered from the error and has become capable of printing. Both modes may be registered beforehand in the LAN-FAX 101.

Furthermore, in the first and second embodiments, the apparatus to which image data is to be transferred is not limited to only one apparatus. Instead, the image data may be transferred to a plurality of apparatuses. In this case, apparatuses are checked to determine if they are available or not, and image data is transferred to the available apparatuses, wherein information about the transfer destinations are memorized for each page.

#### Third Embodiment

In the first embodiment described earlier, if the available space of the image data memory 204 of the LAN-FAX 101 has become insufficient, image data stored in the image data memory 204 is transferred to a server machine 103 so that the available space of the image data memory 204 becomes sufficient to continue the process. In contrast, in a third embodiment described hereinbelow, image data stored in the image data memory 204 remains there, and any further image data that is received is

transferred to another apparatus connected to the LAN.  
With this arrangement, the communication time can be  
shorten compared to that required in the first embodiment.  
In this third embodiment, a method of managing image data  
as well as a memory managing method will also be described  
in detail.

Figure 6 is a schematic diagram illustrating a memory  
area configuration for explanation of the method of  
managing image data memory 204 of the LAN-FAX 101  
according to the present embodiment. In Figure 6,  
reference numeral 601 denotes the entire memory area to be  
managed. In the LAN-FAX 101 of the present embodiment, the  
entire memory area 601 is divided into three areas: a  
transmission memory area (602); a reception memory area  
(603); and a common memory area (604) for use in both  
transmitting and receiving operations. As denoted by  
reference numeral 605, each memory area is further divided  
into n memory areas for management.

Figure 16 schematically illustrates stored-page  
management information according to the present  
embodiment. The stored-page management information and  
stored-data management information shown in Figure 16 are  
stored in assigned areas of RAM 203.

The contents of the stored-page management  
information can be printed out or displayed on a display

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device by issuing an instruction via the operation panel  
212. The stored-page number 1601 stores the page number of  
stored data. The coding scheme of stored data 1602 stores  
the coding scheme of the stored data. The resolution of  
5 stored data 1603 stores the resolution of the stored data.  
The page size of stored data 1604 stores the page size of  
the stored data. The stored-data start location pointer  
1605 is a pointer for pointing the start location of a  
memory area in which the stored-data management  
10 information is actually stored. The stored-data end  
location pointer 1606 is a pointer for pointing the end  
location of a memory area in which the stored-data  
management information is actually stored. The  
next-stored-data pointer 1607 is a pointer for pointing  
15 the location of a memory area in which other stored-data  
management information is actually stored wherein the  
memory area is linked to the previous memory area. The  
memory type 1608 stores information representing whether  
the stored data resides in the internal memory of the  
20 LAN-FAX 101 or in memory of another terminal connected to  
the LAN. The stored-data-pointer/MAC-address-of-data-  
transfer-destination 1609 stores a pointer for pointing  
the stored data when the information stored in the memory  
type 1608 indicates that the data is stored inside the  
25 LAN-FAX 101, or stores an MAC address of a terminal

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be described.

Figures 7-15 are flow charts illustrating the control procedure of the LAN-FAX 101 according to the present embodiment of the invention.

5 Referring to Figures 7-15, the control procedure during a memory reception operation will be described below.

10 When a receiving operation starts in an image processing apparatus according to the present embodiment of the invention, memory allocation is performed first (step S702 in the flow chart of Figure 7). A more detailed flow chart associated with this reception memory allocation is shown in Figure 10.

15 First, the stored-data management information is acquired via the unused stored-data management-information start pointer 1703 so as to determine whether there is available room in the image data memory 204 of the LAN-FAX 101 itself.

20 The decision result of step S1001 in Figure 10 is negative in this case since the operation is in the receiving operation mode. Therefore, the process proceeds to step S1003, in which a positive decision result is obtained and thus the process further proceeds to step S1004. In this step S1004, whether there is available room  
25 in the reception memory 603 is examined. If there is

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In step S1101, it is determined whether the LAN-FAX

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First, based on the LAN address of the file server, a



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the memory allocation procedure returns to the main procedure (S1013). On the other hand, if it has been concluded in step S1009 that the LAN terminal memory has not been acquired, the memory allocation procedure returns to the main procedure with the result indicating a memory allocation error (S1010, S1013).

In the case where the memory allocation in step S702 is unsuccessful, busy-reception action is performed (S707 in Figure 8).

Referring to Figure 8, the busy-reception action S707 will be described in greater detail.

First, busy-communication-line action is performed, that is, information indicating that the LAN-FAX 101 is in a busy-reception status is sent to the terminal with which the LAN-FAX 101 is communicating (S801).

In step S802, it is determined whether the LAN-FAX 101 has recovered from the busy status. If the LAN-FAX 101 has not recovered yet from the busy status, then the process continues step S801. If the LAN-FAX 101 has recovered from the busy status, then information indicating that the the LAN-FAX 101 has recovered from the busy status is sent to the terminal with which the LAN-FAX 101 is communicating (S803), and then the receiving operation is continued (S704).

On the other hand, in the case where the memory

5           If the data receiving is not complete yet, then the  
process repeats the steps from S702.

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stored data, the image data acquisition process S1202 returns to the main process with a result indicating no stored data (S1411, S1412).

5 If it has been concluded in step S1401 that there is stored data, then the data source associated with the memory is identified (S1402) from the information stored in the memory type 1608, and it is determined whether the stored data resides in the image data memory 204 of the LAN-FAX 101 itself or not (S1403).

10 If the stored data resides in the image data memory 204 of the LAN-FAX 101 itself, then the stored data is acquired from the image data memory 204 (S1404). Thus, the image data acquisition process has been completed successfully, and processing returns to the main process  
15 (S1405, S1412).

In the case where the stored data does not reside in the image data memory 204 of the LAN-FAX 101 itself, the terminal information associated with the MAC address of a LAN terminal in which the stored data resides is acquired  
20 from the MAC-address-of-data-transfer-destination 1609 (S1406). Then, inquiry is made as to whether the LAN terminal has the stored data (S1407).

If yes, then the stored-data is acquired from the LAN terminal (S1409), and the process returns to the main  
25 process with a successful result (S1405, S1412).

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5           If the image data has been acquired successfully in  
step S1202, then the image data is transferred to the  
printer 215 (S1204). After the successful completion of  
the transfer, the memory is released (S1205), and step  
S1201 and the subsequent steps are continued. If there is  
10 no image data or if it is impossible to acquire image  
data, then the printing-out process simply returns to the  
main process (S1206).

Referring to Figure 15, the memory releasing process S1205 will be described below in more detail.

If it has been concluded in step S1502 that the stored data resides in the LAN terminal memory, the MAC address of the LAN terminal to which the data was transferred is acquired from the MAC-address-of-data-

transfer-destination 1609 (S1503). After sending a message to the LAN terminal saying that the memory will be released (S1504), the stored-data management information is linked to the unused stored-data management-information end pointer 1704. Then, the memory releasing process returns to the main process (S1506).

On the other hand, if it has been concluded in step S1502 that the stored data does not reside in the LAN terminal memory, then the status of the memory managed by the LAN-FAX 101 itself is changed to an unused status (S1505), and then the stored-data management information is linked to the unused stored-data management-information end pointer 1704. Then, the memory releasing process returns to the main process (S1506).

If it has been concluded in step S708 of Figure 7 that it is not required to print out the received data, then it is determined whether the received data is required to be transferred to a LAN terminal (S710).

If the received data is required to be transferred to the LAN terminal, the received data is transferred to the LAN terminal in step S711, and thus the entire receiving process is complete (S712).

Referring to Figure 13, the process S711 of the data transfer to a LAN terminal will be described below in more detail.

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The information such as the MAC address of a LAN terminal to which the data is to be transferred is acquired from the MAC-address-of-data-transfer-destination 1609 (S1301). The status of the LAN terminal is examined in step S1302. If the LAN terminal is in a normal status, then the image data to be transferred is acquired (S1303). The image data acquisition process in step S1303 is essentially the same as that in step S1202 shown in Figure 12, and therefore it will be not described here again.

If the image data has been acquired successfully in step S1303, the image data is transferred to the LAN terminal (S1305). After the successful completion of the data transfer, the memory is released, and step S1201 and the subsequent steps are continued.

The memory releasing process S1306 is essentially the same as that in step S1205 shown in Figure 12, and therefore it will be not described here again.

In step S1304, if there is no image data or if it is impossible to acquire image data, then the process simply returns to the main process (S1307).

In step S1302, if the LAN terminal is not in a normal status, then the process waits for the recovery of the LAN terminal (S1308).

If the received data is not required to be transferred to the LAN terminal, then the entire receiving

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### Fourth Embodiment

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Here, the data to be transmitted includes image data that is read by the scanner 211, data that is sent to the



LAN-FAX 101 from another LAN terminal via the LAN I/F 214, etc.

In this LAN-FAX according to the present embodiment, when the reading of the transmission data starts, memory allocation is performed (S903) in parallel to the reading operation so that the transmission data can be stored in the allocated area of the image data memory in the LAN-FAX.

This memory allocation process is shown in more detail in Figure 10. In step S1001 shown in Figure 10, the decision result is yes since the process is now in the middle of the transmission operation, and thus the process proceeds to step S1002.

In step S1002 shown in Figure 10, the availability of memory space in the transmission memory 602 is examined. If there is available memory in it, then the transmission memory 602 is allocated (S1006). However, if there is no available room in the transmission memory 602, the availability of the common memory 604 is examined (S1005). If there is available area in it, then the common memory is allocated (S1006).

If neither the transmission memory 602 nor the common memory 604 has available area, then the process proceeds to the LAN allocation process (S1008) as in the case of the receiving operation. This LAN allocation process is

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5 process S903, if the memory allocation has failed, then the data reading operation such as the reading of the image data via the scanner 211 is suspended, and a busy-transmission action is performed (S912). The process waits for successful completion of the memory allocation.

10            If the memory allocation is successfully complete in the memory allocation process S903, then the data reading operation is continued (S905). The process waits for the completion of the data reading operation in step S906.

If the data reading operation is not complete yet,  
15 step S903 and the subsequent steps are repeated.

When the data reading operation is complete, a transmission operation starts (S907), and the data to be transmitted is acquired (S908).

20 Here, the data acquisition process is essentially the same as that in the receiving operation, and therefore the duplicated description about it will not be given.

If the transmission data has been successfully acquired in the data acquisition process S908, then the acquired transmission data is transmitted according to the communication protocol of the LAN-FAX (S910). Then, steps

S908 and the subsequent steps are continued repeatedly.

In the data acquisition process S908, if there is no transmission data, or if the transmission data acquisition has failed, then the entire transmission process is simply terminated (S911).

In the fourth embodiment described above, the transmission operation can be performed without a break in the operation due to lack of the available memory area in the transmission memory. The present embodiment also allows the LAN-FAX 101 to perform high-capacity communication without expanding the image data memory 204 in the LAN-FAX 101 itself.

The communication line to which the LAN-FAX is connected is not limited to the ISDN or PSTN. The LAN-FAX may also be connected for example to an existing digital communication network, a private communication line, or other types of communication lines.

Furthermore, the protocol used in the LAN is not limited to the TPC/IP. Any other type of protocol such as the SPX/IPX may also be employed.

#### Fifth Embodiment

As described above, when a facsimile apparatus is connected to a LAN, it is possible to detect an error or failure that occurs inside the LAN-FAX. However, an error or failure in the LAN, such as disconnection of a

communication cable, has to be detected by a user by means of visual inspection or the like. In this fifth embodiment described here, the LAN-FAX 101 has the capability of detecting such an error in the LAN.

5 Referring to the flow chart shown in Figure 18, the receiving operation of the LAN-FAX 101 according to the present embodiment of the invention will be described.

10 First, the reception service stored in a frame that has been received at the beginning of a call from a sending station is analyzed (step S1801). In this reception service analysis, the DCS (digital command signal) in a G3-type facsimile, NSF (non-standard function) frame, etc., are analyzed. Based on the analysis result, it is determined whether the requested reception  
15 service is a data transfer to a terminal connected to the LAN 100 (step S1802). If data transfer is requested, then it is determined whether the LAN 100 is in an error status or not (step S1803). The status of the LAN is set in such a manner described later referring to the flow chart of  
20 Figure 19. If it has been concluded that there is an error in the LAN 100, then the communication line is disconnected (step S1811), and the receiving operation is terminated. In the case of the G3-type facsimile procedure, the above disconnection of the communication  
25 line is performed by sending a DCN (disconnection) command

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The data transfer to the server machine 103 will be described below in greater detail. First, based on the address of the server machine 103 with respect to the LAN 100, a transfer image (received image) data file is produced. This transfer image data file is configured according to the protocol of the LAN 100 to which the LAN-FAX 101 is connected. In this embodiment, since the protocol of the LAN 100 is defined according to TCP/IP protocol as described above, the transfer image data file is configured according to the TCP/IP protocol. The obtained transfer image data file is sent out via the LAN interface 214 of the LAN-FAX 101 so as to transfer the data file to the server machine 103 via the LAN 100. If a user of the LAN-FAX 101 issues a printing command, a transfer-back request is automatically sent to the server

machine 103, and the received image data file that was transferred to the server machine 103 is printed out.

The data configuration according to the TCP/IP has been described above already, and therefore it will not be described here.

After the LAN-FAX 101 has transferred the image data file associated with the received data, the LAN-FAX 101 deletes the received data (step S1807). Then, the receiving operation is complete. In the above deleting process, the transfer image data stored in the image data memory 204 is deleted.

If it has been concluded in step S1802 that the requested reception service is not a data transfer, then the data is received according to the normal receiving procedure (step S1808). Then, the communication line is disconnected (step S1809). After the disconnection of the communication line, the received image data is printed out using the printer 215 (step S1810), and thus the receiving operation is complete.

In the above steps from S1808 through S1810, the operation is the same as in the case of a usual facsimile apparatus that is not connected to the LAN 100, wherein the received data may also be printed out before the completion of the disconnection of the communication line, or the received data may not be printed out depending on

the requested service. Furthermore, as for steps S1805 and S1806, step S1806 may be performed first, followed by step S1805, or otherwise, these steps may be performed at the same time.

5           Referring to the flow chart of Figure 19, the error detection of the LAN 100 will be described.

          The error detection of the LAN 100 is performed by the LAN-FAX 101 at time intervals set in a TL timer (step S1901). A user can set the TL timer to an arbitrary  
10           interval value. Thus, at the end of each time interval designated by the TL timer, the LAN-FAX 101 determines whether it is in the middle of a communication operation (step S1902). If the LAN-FAX 101 is in the middle of the communication, the error detection of the LAN 100 is  
15           performed after the completion of the communication. (step S1908).

          If the LAN-FAX 101 is not in a communicating operation, then the error detection is performed immediately. In either case, at the beginning of the error  
20           detection process, dummy data or test data is sent to the LAN 100 (step S1903).

          A LAN terminal usually has two ports, a transmission port and a reception port, so that both transmitting and receiving operations can be performed at the same time via  
25           these two ports. In the present embodiment, it is assumed

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that the apparatus has the capability of the  
above-described simultaneous operations. In most LANs such  
as Ethernet (registered trademark of Xerox), data  
transmitted by one terminal is sent via a bus-type network  
to all terminals including the terminal itself that has  
transmitted the data whereby communication among arbitrary  
terminals is achieved. In the present embodiment,  
communication is performed according to this method.

In step S1904, the original dummy data (test data)  
that was transmitted to the LAN 100 in step S1903 is  
compared with the data that has returned back to the  
LAN-FAX 101 after the traveling via the LAN 100. It is  
determined whether these two data are coincident with each  
other. (step S1905). If both data are coincident with each  
other, the LAN 100 is regarded as normal and a normal LAN  
operation is performed according to a predetermined  
procedure (step S1907), and then the process returns to  
step S1901. If there is a difference between the above two  
data, it is concluded that there is an error in the LAN  
100. In this case, a LAN error process is performed  
according to a predetermined procedure (step S1906), and  
then the process returns to step S1901.

In the normal LAN operation, information indicating  
that the LAN 100 is in a normal status is given via the  
external display 217, or the information indicating that

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the LAN 100 is in a normal status is directly written in the LAN status without displaying any information on the external display 217. On the other hand, in the LAN error process, information indicating that there is an error in the LAN 100 is given via the external display 217, and the information indicating that the LAN 100 is in a normal status is written in the LAN status. This LAN status is referred to during the receiving operation shown in Figure 18. As described above, the process periodically returns to step 1901 so as always to provide the newest LAN status to a user.

Figure 20 is a schematic diagram illustrating an example of an indicator for indicating the LAN status to a user.

In Figure 20, reference numeral 2001 denotes a ten-key used for inputting particular data associated with for example PB tones or dial pulses, or used for setting the TL timer interval or the error detection time interval, and reference numeral 2002 denotes start and stop keys used for starting or stopping the operation of the facsimile apparatus, wherein elements 2001 and 2002 are parts of the operation panel 212 shown in Figure 2.

Reference numeral 2003 denotes a message display composed of an LCD or the like, and reference numeral 2004 denotes an LED for indicating the occurrence of an error

in the LAN. These elements 2003 and 2004 form the external display 217 shown in Figure 2. When an error occurs in the LAN, the message display 2003 displays a message indicating what should be done to solve the error, as shown in Figure 20. Reference numeral 2005 denotes a loudspeaker for generating a sound warning of the occurrence of an error in the LAN.

As long as the LAN status includes information indicating that there is an error in the LAN 100, the message display 2003, LED 2004, and loudspeaker 2005 continue the indication of the occurrence of the error in the LAN. However, if the operation panel 212 is operated, then the LAN-FAX understands that a user has acquired the occurrence of the error in the LAN, and the LAN status changes to a normal status. Thus, the message display 2003, LED 2004, and loudspeaker 2005 stop the indication of the LAN error.

In the receiving operation according to the fifth embodiment, when an error in the LAN 100 is detected, a call to the LAN-FAX is refused. However, the present invention is not limited to this. For example, the LAN-FAX may accept a call containing data that is requested to be transferred without refusing it, and may print out the data instead of transferring it. In this case, if it has been concluded in step S1803 of Figure 18 that the LAN

status indicates an error, steps S1808 through S1810 are performed. Furthermore, if the image data memory 204 has a large capacity, the received data may be stored in the memory 204 without printing it out. The information about the above result is given to a data source station as well as the LAN-FAX 101.

In the receiving operation according to the fifth embodiment, the type of service on the received image data is designated by the service information stored in the NSF frame. However, the designation method is not limited to this.

For example, a password is stored in a password (PWD) frame according to the prescription of the ITU-T, so that the LAN-FAX 101 converts the password to service information or the address to which the received data is to be transferred. Furthermore, the existing communication network is not limited to the public telephone network. A digital communication line such as the ISDN may also be employed. In this case, the type of the service on the received image data may be designated by a command or a control document such as CSS, CDCL, CDS, etc., used in the G4-type facsimile.

Furthermore, in the fifth embodiment, the protocol of the LAN is defined according to the TPC/IP. Alternatively, another type of protocol such as the SPX/IPX may also be

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employed.

In the fifth embodiment, the LAN-FAX 100 gives a warning of the occurrence of an error to a user by means of a visual or audible expression. Alternatively, the LAN-FAX 101 sends an audio signal or data to a system manager or an administrative system server via an existing communication line so that a proper action to eliminate the error can be taken.

According to the fifth embodiment of the invention, as described above, there is provided a facsimile apparatus connected to both an existing communication line and a LAN, that has the capability of detecting an error in the LAN thereby allowing a user to do proper action for the error. That is, the facsimile apparatus according to the present embodiment has the capability of monitoring the occurrence of an error in the LAN at periodic intervals set to an arbitrary value by a user.

Furthermore, when an error occurs in the LAN, information of the error occurrence is given to a user, thereby allowing the user to properly deal with the error before starting the operation of the facsimile apparatus. Thus, the facsimile apparatus according to the present embodiment of the invention provides an excellent user interface.

Furthermore, if the facsimile apparatus receives a

call when there is an error in the LAN, the type of received data is determined. If the data transfer is requested, then the facsimile apparatus refuses the reception of the call thereby preventing the memory of the facsimile apparatus from being full. Thus, the facsimile apparatus according to the present embodiment of the invention provides improved capabilities.

#### Sixth Embodiment

In one of techniques known in the art, an external apparatus such as a personal computer is connected to a facsimile apparatus so that the external apparatus issues various commands associated with reading, transmission, or other operations to the facsimile apparatus. However, in the above known technique, the external apparatus that is connected to the facsimile apparatus must have a special capability.

Furthermore, in the case where a plurality of client machines and facsimile apparatuses are connected to a LAN, only a special client machine can issue commands to force the facsimile apparatuses to particular operations.

In view of the above, a sixth embodiment of the invention provides a method that allows a plurality of client machines connected to a LAN to make effective use of a facsimile apparatus.

Referring to the time chart shown in Figure 21, an

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example of automatically setting a mode of a LAN-FAX 101 will be described below.

If a packet associated with a transmission request is sent from a certain client machine 104 to the LAN-FAX 101 at timing denoted by (1) in Figure 21, then the operation mode is set to a transmission mode, and the LAN-FAX starts a transmission operation to transmit the packet associated with the transmission request to a designated destination. In this case, as a matter of course, the packet contains a transmission request in its data area. The term "timing" is used here to refer to the timing of the packet according to the TCP/IP protocol that is employed here as the protocol of the LAN 100.

Furthermore, if the LAN-FAX 101 receives another packet associated with a print request from another client machine 104 at timing (2), then the LAN-FAX 101 additionally establishes a print (record) mode and starts a print operation to print the data contained in the packet associated with the print request using the printer 215. In this case, the CPU 201 performs control operations associated with both transmission and print in parallel by means of time-sharing.

After the completion of the transmission of the successive data wherein the data was divided into a plurality of packets and sent to the LAN-FAX 101 from the

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a transmission request) produces a transmission image data file based on the address of the client machine itself with respect to the LAN 100. This transmission image data file is configured according to the protocol of the LAN to which the client machine 104 is connected. More specifically, the protocol of the LAN in this embodiment is defined according to the TCP/IP protocol, and therefore the transmission image data file is configured according to the TCP/IP protocol. The data configuration according to the TCP/IP has been described already earlier, and therefore it is not explained here again.

The data field 2408 includes data such as image data and process commands. Since the maximum data length of this data field 2408 is limited as shown in Figure 24, when image data or other data is transmitted, a plurality of packets are sent for one process (print process, for example).

In this embodiment, when image data to be transmitted is stored in memory of the server machine 103, it is required to identify its file type, file number, and process mode. For this purpose, a command data header containing the above file information and an image data file containing image data are disposed in the above data field, thereby achieving correct transmission control. The file information contained in the command data header is



analyzed by application software for file type analysis installed on the server machine 103, whereby the type of the image file and other information are managed by the server machine 103.

5           Referring to the flow chart shown in Figure 22, the automatic setting of the process mode of the LAN-FAX 101 will be described below.

10           First, the LAN-FAX 101 receives, via the LAN interface 214, the above file sent from the server machine 103 in the form of packets, and accepts a request represented by a process command (step S2201). Then, the accepted process command is analyzed to determine what operation mode is requested, and the new operation mode is set based on the above analysis result of the process command (step S2202). Thus, the operation mode is set to one of: a communication mode; printing mode; or reading mode.

15           Then, it is determined whether the new operation mode is coincident with the current operation mode that was set previously (step S2203). Even if both modes are coincident with each other in the above comparison process, the received data will be regarded as invalid data if there is an inconsistency in the address of the client machine 104 (or otherwise if a message is sent to the server machine 103 to tell that the data is

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unacceptable because the LAN-FAX is busy with another data of the same type).

On the other hand, if the new operation mode is not coincident with the current operation mode that was set previously, the new operation mode is employed as the current operation mode via the selector 218 (step S2204), and then the process proceeds to step S2205. If the new operation mode is coincident with the current operation mode that was set previously, the process proceeds to step S2205 without changing the operation mode.

If the current operation mode is changed to a communication mode, the communication line or the LAN connection is changed via the selector 218 so that the LAN-FAX is connected to the destination to which the data is to be transmitted.

Then, the type of the operation mode corresponding to the process command (associated with the new mode) is detected (step S2205), and an instruction directing that the operation corresponding to the detected mode should start is given (steps S2206-S2208). According to this instruction, if it has been concluded that the new operation mode corresponding to the command contained in the packet is for example a transmission mode, then the data that has been received this time and that is requested to be transmitted is stored in the transmission

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## Seventh Embodiment

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mode, until one process has been complete. After the completion of one process, the process mode may be automatically switched to a new mode if necessary.

5       The fixed process mode according to the seventh embodiment of the invention will be described further referring to the flow chart shown in Figure 23.

10       In the fixed process mode, the LAN-FAX receives via the LAN interface 214 a file sent in the form of packets from the server machine 103, and accepts a request represented by a process command (step S2301). Then, the accepted process command is analyzed to determine what operation mode is requested, and the new operation mode is set based on the above analysis result of the process command. Thus, the operation mode is set to one of: a  
15       communication mode; printing mode; or reading mode. (step S2302).

20       Subsequently, it is determined whether the process mode is a continuation mode or not (step S2303). At the first reception of a packet after the starting of the apparatus and at the first reception of a packet after the completion of one process, the process mode is assumed to be not a continuation mode. At the second reception of a packet, it is determined whether the new mode is coincident with the current mode. If both are coincident  
25       with each other, the process mode is set to a continuation

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5           As described above, the present invention provides a data processing apparatus connected to a LAN, that has no problems such as those in conventional techniques, wherein its various capabilities can be used effectively.

While the present invention has been described with  
10 reference to specific preferable embodiments, the  
description is illustrative of the invention and is not to  
be construed as limiting the invention. It will be  
apparent to those skilled in the art that various  
modifications are possible without departing from the true  
15 spirit and scope of the invention as defined by the  
appended claims.